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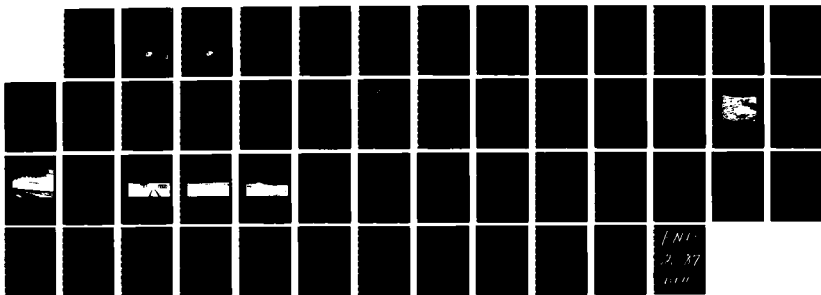
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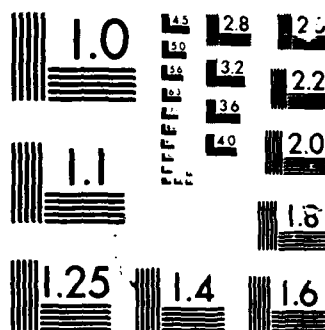
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LOUISIANA ARMY AMMUNITION PLANT

SHREVEPORT, LOUISIANA

FINAL REPORT

AUGUST 1984



This document was prepared by the MacDonald and Mack Partnership, Minneapolis, Minnesota, under Contract CX-0001-2-0033 between Building Technology Incorporated, Silver Spring, Maryland, and the Historic American Buildings Survey/Historic American Engineering Record, National Park Service, U.S. Department of the Interior.

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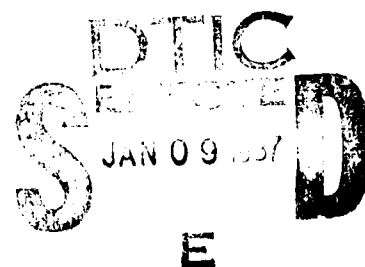
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EXECUTIVE SUMMARY

The Louisiana Army Ammunition Plant (LAAP) was constructed beginning in 1941 for loading, assembling, and packing a variety of types of conventional ammunition. The LAAP was one of 60 such plants constructed at the onset of World War II. It was expanded during the Korean War, and has remained in active service since. Located on a 14,974 acre site between Shreveport and Minden, Louisiana, the facility is part of the Army's Armament, Munitions and Chemical Command (AMCCOM) and presently comprises 674 buildings, 364 of which date from World War II. One production area was destroyed in a 1968 explosion.

The architecture on the site is utilitarian in style. All of the original production equipment has been replaced as the plant has retooled to meet changing production requirements. There are no Category I, II, or III historic properties at the LAAP.



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CONTENTS

Executive Summary

PREFACE	1
1. INTRODUCTION	3
Scope	3
Methodology	4
2. HISTORICAL OVERVIEW	14
Background	14
World War II	17
Korean War	30
Vietnam War	33
3. PRESERVATION RECOMMENDATIONS	38
Background	38
Category I Historic Properties	43
Category II Historic Properties	44
Category III Historic Properties	44
BIBLIOGRAPHY	45

PREFACE

This report presents the results of an historic properties survey of the Louisiana Army Ammunition Plant (LAAP). Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at the LAAP. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archaeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was

project manager for the historic properties survey. Technical assistance was provided by Donald C. Jackson.

Building Technology Incorporated acted as primary contractor to HABS/HAER for the historic properties survey. William A. Brenner was BTI's principal-in-charge and Dr. Larry D. Lankton was the chief technical consultant. Major subcontractors were the MacDonald and Mack Partnership and Jeffrey A. Hess. The authors of this report were Stuart E. MacDonald and David A. Fey. The authors gratefully acknowledge the help of Huey Riche, Carl McDaniel, and especially James H. Solesbee, Facilities Projects Manager, Thiokol Corporation, LAAP.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation HAER No. LA-3.

Chapter 1
INTRODUCTION

SCOPE

This report is based on an historic properties survey conducted in April 1983 of all Army-owned properties located within the official boundaries of the Louisiana Army Ammunition Plant (LAAP). The survey included the following tasks:

- . Completion of documentary research on the history of the installation and its properties.
- . Completion of a field inventory of all properties at the installation.
- . Preparation of a combined architectural, historical, and technological overview for the installation.
- . Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 22 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army. Archival copies of the cards, with their accompanying photographic

negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

METHODOLOGY

1. Documentary Research

The Louisiana Army Ammunition Plant (LAAP) was one of several government-owned, contractor-operated facilities constructed during 1940-1942 for the manufacture and storage of conventional ammunition. Since the plant was part of a larger manufacturing network, an evaluation of its historical and technological significance requires a general understanding of the wartime ammunition industry. To identify published documentary sources on American ammunition manufacturing during World War II, the Korean War, and the Vietnam War, research was conducted in standard bibliographies of military history, engineering, and the applied sciences. Unpublished sources were identified by researching the historical and technical archives of the U.S. Army Armament, Munitions and Chemical Command (AMCCOM) at Rock Island Arsenal.¹

In addition to such industry-wide research, a concerted effort was made to locate published and unpublished sources dealing specifically with the history and technology of the LAAP. This site-specific

research was conducted primarily at the AMCCOM Historical Office at Rock Island Arsenal; the Shreveport Public Library; the Minden Public Library; the R.W. Norton Library, Shreveport; the Louisiana State Historic Preservation Office; and the LAAP government and contractor files.

On the basis of this literature search, a number of valuable sources were identified. These included a series of detailed, unpublished quarterly histories from 1943 and 1944 prepared by the original contractor-operator. The histories are illustrated with a site plan, construction drawings and photographs. The State Historic Preservation Office had no pertinent information.

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and photographs supplied by installation personnel; and installation master planning, archaeological, environmental assessment, and related reports and documents. A complete listing of this documentary material may be found in the bibliography.

2. Field Inventory

Architectural and technological field surveys were conducted in January, 1983 by Stuart MacDonald and Robert Mack. Primary assistance during the field survey was provided by James H. Solesbee, Facilities

Projects Manager, Thiokol Corporation, LAAP. Additional assistance and guidance was provided by Huey Riche, Carl McDaniel, and Mary Frances Roberts.

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.² All areas and properties were visually surveyed.

Building locations and approximate dates of construction were noted from the installation's property records and field-verified. Interior surveys were made of the major production facilities to permit adequate evaluation of architectural features, building technology, and production equipment.

Field inventory forms were prepared for, and black and white 35 mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to represent all buildings of that type. Field inventory forms were also completed for representative post-1945 buildings and structures.³ Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

3. Historical Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and

the field inventory. It was written in two parts: 1) an introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses. Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of Historic Places. These criteria require that eligible properties possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following:⁴

- A. Are associated with events that have made a significant contribution to the broad patterns of our history.

- B. Are associated with the lives of persons significant in the nation's past.
- C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- D. Have yielded, or may be likely to yield, information important in pre-history or history.

Properties thus evaluated were further assessed for placement in one of five Army historic property categories as described in Army Regulation 420-40:⁵

- Category I Properties of major importance
- Category II Properties of importance
- Category III Properties of minor importance
- Category IV Properties of little or no importance
- Category V Properties detrimental to the significance of adjacent historic properties.

Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used

to assess the importance not only of properties of traditional historical interest, but also of the vast number of standardized or prototypical buildings, structures and production processes that were built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

- 1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.
- 2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process. This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples of the design or process was considered to be. This criterion was also used for non-military structures such as farmhouses and other once prevalent building types.
- 3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important

condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.

- 4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance, but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures;

rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- Current structural condition and state of repair. This information was taken from the field inventory forms and photographs, and was often supplemented by rechecking with facilities engineering personnel.
- The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review by Building Technology Incorporated. It was then sent in draft to the subject installation for comment and clearance and, with its associated historical materials, to HABS/HAER staff for technical review. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archaeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

NOTES

1. The following bibliographies of published sources were consulted: Industrial Arts Index, 1938-1957; Applied Science and Technology Index, 1958-1980; Engineering Index, 1938-1983; Robin Higham, ed., A Guide to the Sources of United States Military History (Hamden, Conn.: Archon Books, 1975); John E. Jessup and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington, D.C.: U.S. Government Printing Office, 1979); "Military Installations," Public Works History in the United States, eds., Suellen M. Hoy and Michael C. Robinson (Nashville: American Association for State and Local History, 1982), pp. 380-400. AMCCOM (formerly ARRCOM, or U.S. Army Materiel Readiness Command) is the military agency responsible for supervising the operation of government-owned munitions plants; its headquarters are located at Rock Island Arsenal, Rock Island, Illinois. Although there is no comprehensive index to AMCCOM archival holdings, the agency's microfiche collection of unpublished reports is itemized in ARRCOM, Catalog of Common Sources, Fiscal Year 1983, 2 vols. (no pl.: Historical Office, AMCCOM, Rock Island Arsenal, n.d.).
2. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).

3. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.
4. National Park Service, How to Complete National Register Forms (Washington, D.C.: U.S. Government Printing Office, January 1977).
5. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).

Chapter 2

HISTORICAL OVERVIEW

BACKGROUND

The Louisiana Army Ammunition Plant (LAAP) is a government-owned, contractor-operated installation situated on 14,974 acres approximately twenty-two miles east of Shreveport and ten miles west of Minden, Louisiana (Figure 1). The plant was constructed in 1941-1942 primarily for loading, assembling, and packing ammunition, including bombs, projectiles, auxiliary boosters, mines, fuzes, and primers. Immediately following V-J Day, the LAAP suspended its load, assemble, and pack activities and assumed the status of a "stand-by" plant. When the plant was reactivated for major production runs during the Korean War, its industrial mission expanded to include the manufacture of metal parts for 155mm artillery shells — an expanded mission in force during the Vietnam conflict and today.

At present, the LAAP comprises 674 buildings, 374 of which date from the original construction period (Figure 2). Although most major World-War-II-era production buildings remain, the plant's original production machinery has been replaced.

For a more detailed understanding of the plant's architectural and technological history, it is necessary to look more closely at the site's three major production periods: World War II, the Korean War, and the Vietnam War.

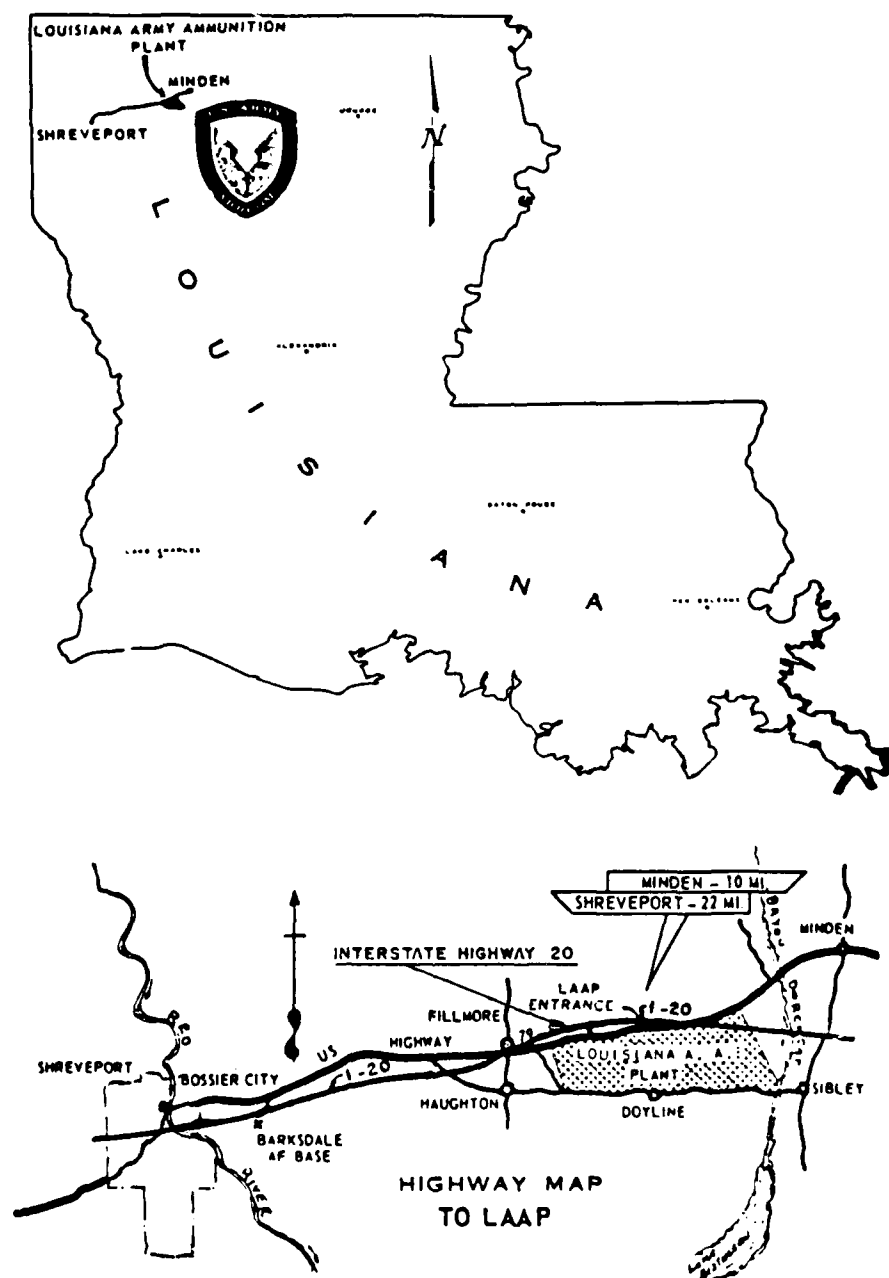


Figure 1: Louisiana Army Ammunition Plant. Location Map. (Source: Plant Information Brochure.)

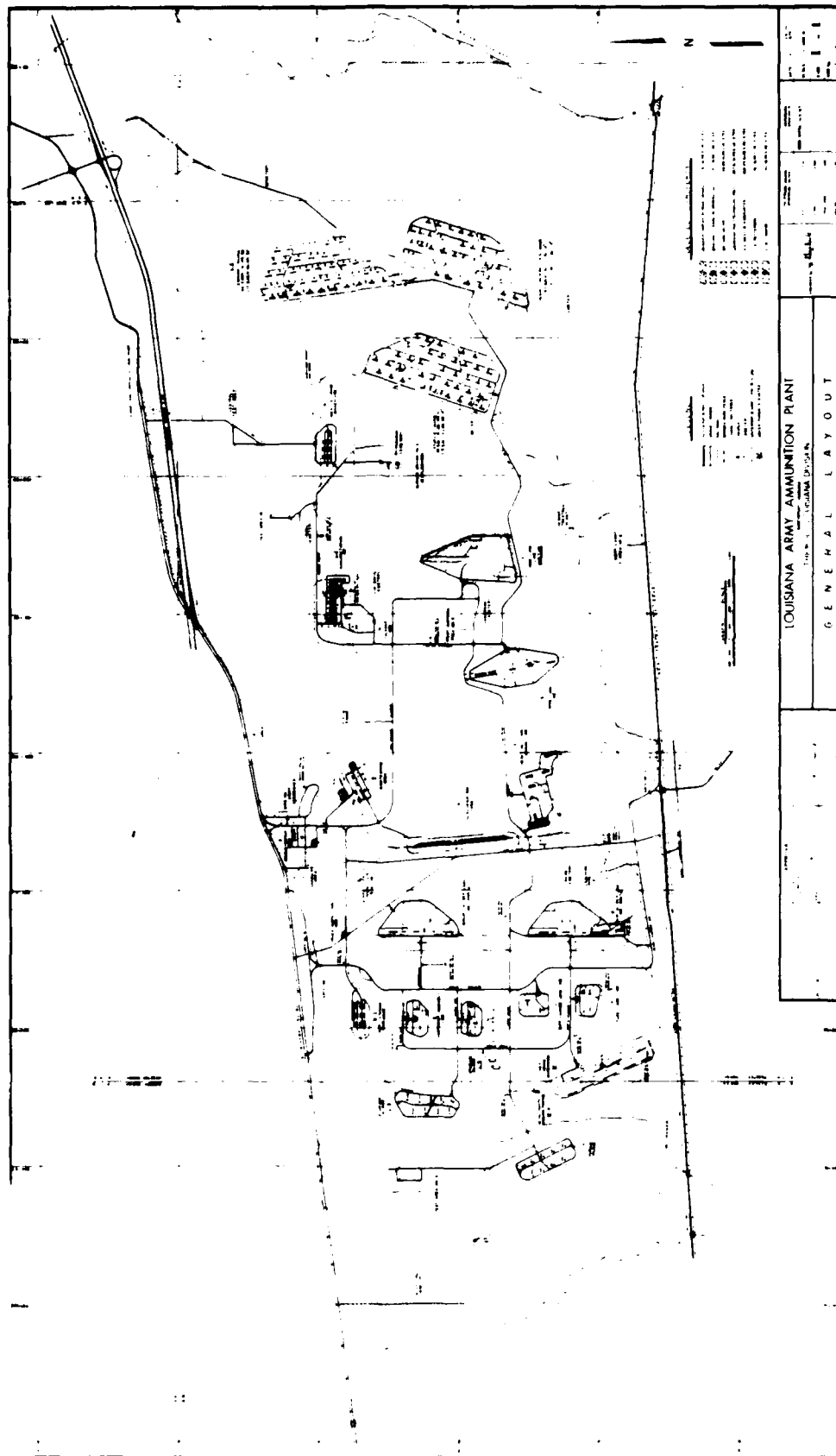


Figure 2: Louisiana AAP. Current site plan prepared by Thiokol Corporation, revised September 26, 1980. (Source: Thiokol Corporation, LAAP.)

WORLD WAR II

When war broke out in Europe in the fall of 1939, the United States had virtually no industrial capacity for manufacturing military ammunition. As historians Harry C. Thomson and Lida Mayo observed in their authoritative work on American munitions production:

Only a handful of small plants were making propellant powder and high explosives, and there were virtually no facilities for the mass loading and assembling of heavy ammunition. American industry was just beginning, through educational orders, to learn techniques for forging and machining shells and producing intricate fuze mechanisms. The only sources for new artillery ammunition were Frankford and Picatinny Arsenals, while a few ordnance depots were equipped to renovate old ammunition. Private [military] ammunition plants did not exist, and, because of the specialized nature of the process, there were no commercial plants that could be converted to ammunition production.

To meet this situation the Ordnance Department took steps in the summer of 1940 to create something new in American economic life -- a vast interlocking network of ammunition plants owned by the government and operated by private industry. More than 60 of these GOCO (government-owned, contractor-operated) plants were built between June 1940 and December 1942.

The Louisiana AAP was one of the sixty.

Selection and Former Land Use

The selection of the LAAP site was governed by basic criteria used in evaluating locations for all load, assemble and pack facilities. These considerations included:

- (a) a non-coastal location as a defense against attack
- (b) remoteness from large centers of population

- (c) remoteness from other ammunition plants for reasons of security
- (d) availability of large tracts of land to permit necessary safe distances separating production areas and separating storage areas
- (e) availability of suitable labor
- (f) proximity to main highways and railroad lines
- (g) availability of adequate electrical power
- (h) availability of natural gas for processing purposes
- (i) ample supply of water for processing purposes.²

The LAAP site satisfied all criteria: it was non-coastal, remote, and large (15,868 acres*); the Shreveport/Minden vicinity housed a sizable industrial work force; U.S. Highway 80 and the Louisiana and Arkansas Railroad paralleled the site to the north -- the Illinois Central to the south; the Louisiana Power and Light Company and the Arkansas-Louisiana Gas Company provided an adequate, reliable supply of electricity and natural gas; and water was plentiful from on-site wells.³

Until government acquisition, the land had been used primarily for agricultural purposes. When construction began on July 20, 1941, numerous buildings already on the property were converted into temporary offices and warehouses. According to the Silas Mason Company, the plant's builder and operator:

Existing buildings included homes, barns and other structures, including a church... The church became a time office, former

* Seven perimeter tracts of land totaling 894 acres have been transferred from government ownership. Current plant acreage is 14,974.

homes became offices for departments while barns and other structures were used for storage. Scattered farm houses which were accessible by existing roads were also used. A former filling station on Highway 80 became a filling station for the job while a nearby farm house became the employment office.⁴

Without exception, all pre-1941 structures were eventually eliminated from the site.*

Construction

On July 10, 1941, a contract was awarded to the Silas Mason Company of New York City for the design, construction, and operation of the LAAP.^{5**} As originally intended, ". . . the plant was to function for the duration [of the war] and then be dismantled. . . ." ⁶ Only temporary-type construction was authorized. "Details of design and methods of construction were left to the Contractor under the supervision of the Constructing Quartermaster and of the Commanding Officer of the Ordnance Department."⁷ Immediately following the attack on Pearl Harbor, all construction activities were placed under the jurisdiction of the Army Corps of Engineers.⁸

The Silas Mason Company was well suited to the task at hand — their personnel had nearly identical experience during the First World War and

* Nine small pre-1941 cemeteries remain at various locations on the plant site.

** Throughout the World-War II era, the LAAP was officially designated as the Louisiana Ordnance Plant. The plant's current name is used throughout this report for the sake of brevity and clarity.

had recently assisted during the construction of Radford and ~~Low~~ Ordnance Works.⁹ Mr. H.L. Myer, Vice President of Silas Mason and supervisor of the LAAP project, wasted little time implementing the contract. On July 20 work began surveying the site and converting existing buildings to temporary facilities. On July 22 railroad and access road work commenced. On August 7 ground was broken for construction of the Administration Building (Building Number 100). By December 1941 the work force had reached its maximum of approximately 11,000,¹⁰ and by May 1942 the plant was virtually complete with eight lines producing ammunition (Areas C, D, E, F, G, H, J, and K).¹¹ A ninth production line, Area S, was added in 1945.¹² In all, 709 buildings were constructed, approximately one-third of which served in ammunition production areas¹³ (Figure 3).

The buildings of the LAAP, generally, were grouped by function into designated "Areas" dispersed throughout the site (see Figure 4 for 1945 plant layout). The ammunition production areas were separated from one another by distances sufficient to preclude sympathetic explosions and/or structural damage at adjacent areas -- a catastrophic incident at one area, therefore, would not endanger adjacent areas.¹⁴ Such required distances were calculated using standard spacing formulas equating distances in feet to the quantity of explosives in pounds. Finished ammunition and explosives storage igloo areas (Areas L-1 to L-5 and M-1) were situated at the east and west perimeters of the site with their igloos similarly spaced according to standard formulas¹⁵ (Figure 5).



Figure 3: Louisiana AAP. Construction progress photograph dated December 16, 1941. (Source: Contractor files, LAAP.)

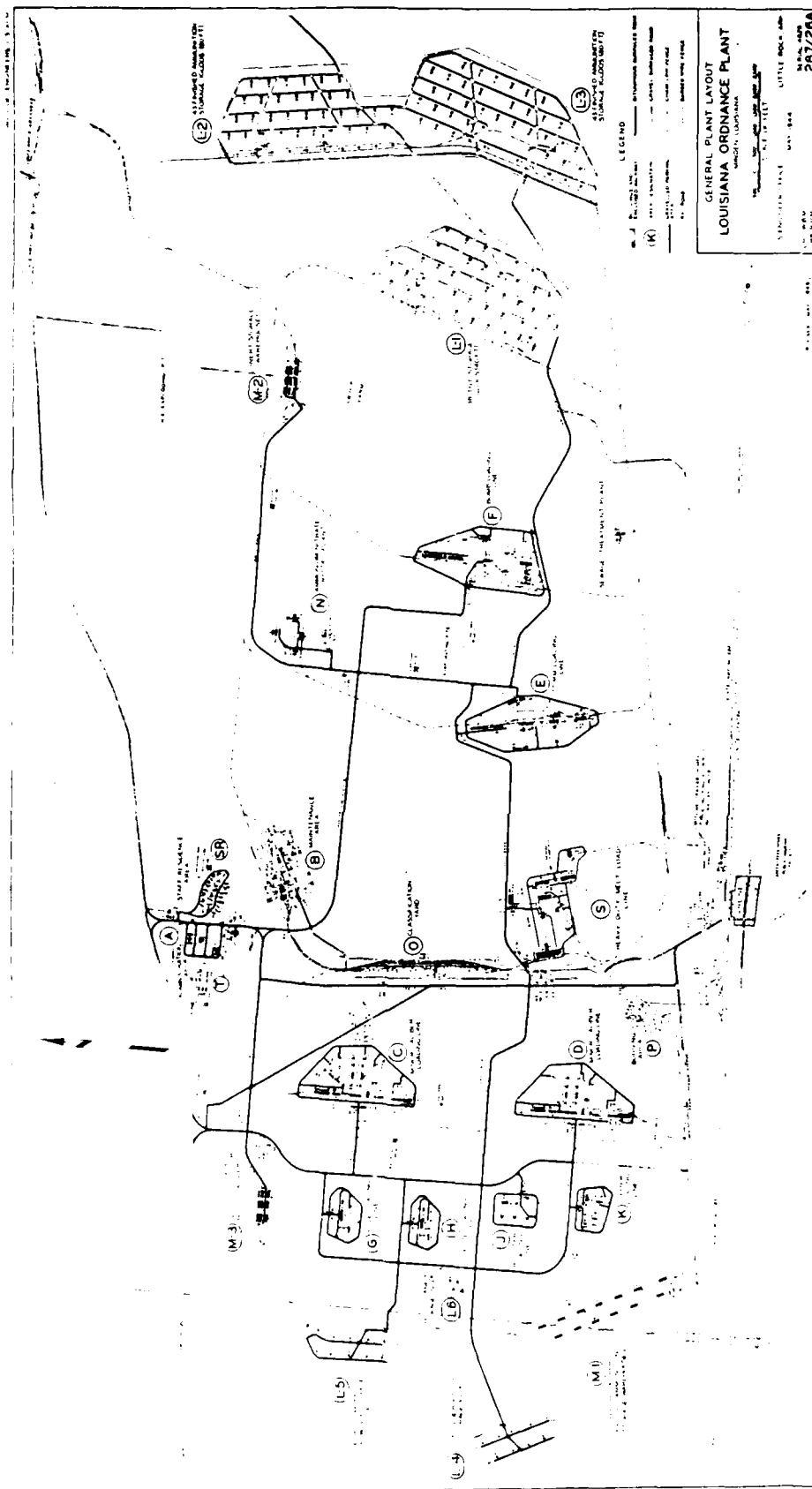


Figure 4: Louisiana Ordnance Plant. 1945 site plan prepared by U.S. Army Corps of Engineers. (Source: "Industrial Facilities Inventory Report, Louisiana Ordnance Plant" in contractor files, LAAP.)



Figure 5: Louisiana AAP. Typical explosives storage igloo number 2411, Area L-2. (Source: Field inventory photograph.)

Individual production area layout reflected industrial function and concerns for safety. Typically, production areas featured an extended, linear arrangement of widely spaced buildings interconnected by enclosed "ramps" which housed conveying systems.¹⁶ For example, the buildings of Area E, a 155-mm loading line, had a cumulative length of over one-half mile. In terms of functional importance, its major buildings were a change house and boiler room (Building 1703), an inert storage warehouse (Building 1726), a metal parts assembly warehouse (Building 1724), a melt-and-pour building (Building 1719), a TNT screen building (Building 1720), and two final assembly, loading and packing buildings (Buildings 1707 and 1712) -- all joined by ramps up to 480 feet in length. Loading lines at Areas C, D, F, and S also employed the melt-and-pour process and were of similar scale and arrangement (Figure 6). Fuze, booster, and primer production required a less extensive industrial plant (melt-and-pour facilities were not necessary); therefore, loading lines at Areas G, H, J, and K were relatively smaller in scale (Figure 7).

Buildings were constructed in a "temporary" manner "good enough to stand up for five years,"¹⁷ and, for the most part, were strictly utilitarian in style (Figure 8). As described by the Silas Mason Company:

In general, loading lines were constructed with concrete floors, [internal concrete baffle walls], wood frame, corrugated asbestos siding and asbestos shingle roof nailed to sheathing supported by roof trusses of wood. There was some choice but not a wide choice of materials. Asphalt Protected Metal could have been used as siding and roof, but it was not favored for loading lines since it is less fire resistant than is the corrugated asbestos. Also, its color is not good for a hot climate while the light gray of the asbestos reflects rather than absorbs heat... Corrugated asbestos could be obtained only at a certain rate and that rate was not sufficient to keep building activities continuous if it were used for all purposes for which it was



Figure 6: Louisiana AAP. Melt-and-pour building number 1331, Area C.
(Source: Field inventory photograph.)



Figure 7: Louisiana AAP. Pelleting building number 1319, Area C.
(Source: Field inventory photograph.)



Figure 8: Louisiana AAP. Metal parts manufacturing building number 2702, Area M-4. (Source: Field inventory photograph.)

preferred. As a consequence, a decision was made to roof with asbestos shingles and to use the Asphalt Protected Metal for storage houses and shops.¹⁸

Only in the administration and staff housing areas was attention paid to architectural appearance.

Technology

The LAAP began manufacturing munition in May 1942 and remained in production until August 24, 1945 ("stand-by" status soon followed on September 6).²⁰ Over this twenty-eight-month period, the plant demonstrated considerable versatility, turning out 65 different kinds of munitions,²¹ including: 75-mm rounds and anti-tank mines (Area C); 76-mm and 3" fixed rounds (Area D); 100-pound bombs (Area E); 250-pound bombs (Area F); M56 and M85 fuzes (Area G); renovated fuzes (Area H); auxiliary boosters (Area J); bomb nose and tail fuzes (Area K); and 155-mm HE projectiles.²² Total World War II production exceeded 100 million items.²³

The load, assemble and pack process at LAAP primarily consisted of the final assembly of component parts and materials into complete ammunition. This process, common to all load, assemble and pack facilities, has been described in the following way:

The explosives, shell or bomb casings, cartridge cases, fuzes, primers, boosters, and detonators are received from outside manufacturers. They are then inspected and stored, until required, in the loading departments. The loading and assembling of these materials is carried on as an assembly-line process. Various departments or so called "load lines" are maintained for the processing of each particular type of ammunition. Thus, a plant may have, in addition to one or more shell- or bomb-load lines, separate lines for loading such component parts as

detonators, fuzes, primers, and boosters. In some cases, however, these smaller components are received from other plants, already loaded with the explosive charge and ready for final assembly into the completed projectile.

The main loading operation for shells and bombs is generally performed by either the melt-load or the press-load process. On the load line, the shell or bomb casings are cleaned, inspected and painted. Large-caliber shells and bombs are usually filled by the melt-load process, the major operations of which consist in screening, melting, and pouring the main explosive or bursting charge into the shell or bomb cavity. The most commonly used bursting charge is TNT, which is readily melted either alone or with ammonium nitrate. After the TNT has hardened, the booster and fuze are inserted. Some large-caliber shells are shipped to combat zones unfuzed, and the fuze is assembled in the field prior to firing the shell. In the case of fixed and semifixed rounds of ammunition, the projectile is assembled to the cartridge case, which contains the propellant charge and artillery primer. The final operations involve labeling and packing or crating for storage or shipment. Inspection is carried on continuously at each stage of the operation.

The operations performed on the lines loading shells by the press-load process differ somewhat from those where the melt-loading process is used. The main explosive charge is loaded into the projectile in a dry, rather than molten state, and consolidated into the shell by means of a hydraulic press. Press loading is most generally applied to smaller-caliber shells, such as those used in 20-mm and 40-mm cannon.

The process of loading such component parts as fuzes, boosters, detonators, and primers is largely confined to very simple assembly work. Artillery primers, the bodies of which are metal tubes filled with a specified amount of black powder, are generally loaded on a volumetric loading machine. The heads, containing a small percussion element which ignites upon friction from the firing pin, are staked to the loaded bodies. Most of the operations on the primer-load lines are mechanized.

The method of loading detonators, fuzes, and boosters varies somewhat from plant to plant, but in general the operations involve a large amount of bench assembly work. On the booster-loading line, for instance, each minute task is performed at long tables having numerous stations. Although most of the operations are performed by hand, small crimping and staking machines are used at the tables to assemble the various parts. 24

Throughout the 1942-1945 period, ammunition production lines and machinery at the LAAP were continually modified in response to changing materiel needs for the war effort. A 1943 plant history, for example, notes that

Area D, "which until November 1943 had loaded 37-mm ammunition was converted to a Medium Caliber Line, having received orders to load 76mm and 3 inch ammunition during December 1943 and in 1944."²⁵ Other lines were similarly affected.

The LAAP also responded to technological innovation, most notably by adopting the volumetric-multiple-pour machine procedure for loading. In the plant's three story melt-and-pour buildings (Buildings 1331, 1222, 1719, 1908 and 1610 in Areas C, D, E, F and S), TNT flows "by gravity from the transporters to melter, to the Dopp kettle [a hot-water-jacketed kettle at the second floor level which maintains the molten TNT at a constant 177.1 degrees F], to the tempering tanks, to the pouring machine and into the shells."²⁶ Volumetric-multiple-pour machines were capable of simultaneously loading up to sixty shells. Previously, the molten TNT was drawn down from the Dopp kettles into first floor tubs and then poured from hand-held buckets into the casings, an inefficient, labor-intensive endeavor prone to error.

KOREAN WAR

On February 23, 1951, production facilities at the LAAP were reactivated for the Korean War. The plant was operated by the Remington Rand Corporation and remained in operation until 1958, when it was deactivated and reverted to "stand-by" status.²⁷

Construction

During the early 1950s, rehabilitation work was completed in each of the nine loading lines at the LAAP site,²⁸ which were then placed back into production. Concurrently, 63 buildings (mostly storage, utility and maintenance structures) and one metal parts facility, a 155-mm shell manufacturing line (Area Y), were newly constructed.²⁹ Area Y was built by the U.S. Army Corps of Engineers according to the designs prepared by Remington Rand,³⁰ and, in terms of size and functional importance, was dominated by its 325,682 square foot shell plant building (Building 2600). Upon production of an acceptable pilot lot of 155-mm casings in October 1953,³¹ the LAAP became the only munitions plant in the United States at that time to both manufacture and load 155-mm artillery shell casings.³²

Technology

During the Korean War, the LAAP witnessed no major technological innovations in its load, assemble and pack operations; however, the plant retained its versatility, producing some 16 different types of munitions. War production included 57-mm, 75-mm and 76-mm cartridges, anti-personnel and anti-tank mines, fuzes, and 155-mm HE projectiles.³³ Casings for the 155-mm projectile loading line (Area S) were manufactured at Area Y.

Unlike small arms ammunition, which was manufactured as self-contained cartridges, 155-mm ammunition was literally put together on the battlefield. Primer, propellant, and shell were each loaded separately

into the breach of the cannon, "since one of these shells with an attached cartridge case loaded with the propelling charge would be too heavy to handle on the firing line."³⁴ The shell was essentially a hollow steel casing filled with explosives and tipped with a detonating fuze. Typically, each of these shell parts was manufactured by separate munitions works, and final assembly was the responsibility of specialized loading plants. Basic production methods for 155-mm shell casings had been developed at Frankford Arsenal during the late 1930s, but effective, mass-production techniques did not appear until private contractors grappled with the problem on their own production lines in the early 1940s. Willys-Overland Motors Company played a leading role in this technological development, and their plant in Toledo, Ohio, became "the clearing house for information on the best method of manufacturing 155-mm shell [casings]."³⁵ A decade later, the four production lines at Area Y still resembled those which had been used at the Willys plant. Major departures from the earlier prototype resulted from improved materials handling procedures and equipment.³⁶

At the LAAP, the 155-mm process began with the nicking and breaking of steel bars into billets of appropriate length. The billets were heated in furnaces, pierced to form their interior cavity, and drawn to their rough cylindrical shape and length. These cylinders were then subjected to a series of turning, pressing, heat-treating, and cleaning operations designed to produce the projectiles' proper shape, dimensions, and hardness. Following these "rough-turn" and "finish-turn" procedures, a knurled groove was cut into the lower end of the casing, and a rotating band pressed into place. During the pressing process, the knurlings in the

groove imprinted the band with ridges, which were designed to engage the gun rifling when the projectile was fired. Next, a steel disc was welded onto the base end of the casing to seal off any invisible cracks that might cause the shell's premature detonation in the gun barrel. With this step completed, the casing required only painting and final inspection before being delivered to Area S for loading.³⁷

VIETNAM WAR

On September 20, 1961, the LAAP was reactivated for the Vietnam War.³⁸ The plant has remained in operation to the present, but not at full production capacity.³⁹ On January 1, 1976, the Thiokol Corporation took over operation of the LAAP.⁴⁰

Construction

During the 1960s and early 1970s, both the load, assemble and pack and the metal parts facilities at the LAAP site were placed back into production. Concurrently, 134 buildings (mostly storage, utility and maintenance structures) and another metal parts facility, a small grenade componentry production line (Area M-4, which is wholly contained within Area M-1), were newly constructed.⁴¹ On August 16, 1968, an explosion and subsequent fire destroyed 19 buildings at Area F, a mine load line. An additional 19 buildings structurally damaged by the force of the explosion were judged to be unsafe and were burned. Only a sentry house, pump station, and Quonset survived.⁴²

Technology

During the Vietnam War, the plant's load, assemble and pack operations kept pace with current technology and remained versatile, producing nearly 60 different types of munitions. Production included mines, shaped charges, fuzes, boosters, bombs, demolition blocks, 2.75" rockets, 57-mm cartridges, mortars, and 155-mm projectiles.⁴³ 155-mm shell casing production continued at Area Y.

In the late 1970s, C-line was modified to load, assemble and pack 155-mm M692 ADAM (Area Denial Artillery Munitions) projectiles which carry a cargo load of anti-personnel mines. At the same time, Y-line was extensively modernized for the production of 155-mm M483 ADAM projectiles which also carry a mine cargo.⁴⁴ The M483 features a separate aluminum projectile base and ogive (both are finish-turned from rough castings in Area M-4, Building No. 2702) and a fiberglass-wrapped body designed to redistribute the projectile's weight and improve its aerodynamics.

NOTES

1. Harry C. Thomson and Lida Mayo, The Ordnance Department: Procurement and Supply (Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960), pp. 104-105.
2. Thomson and Mayo, p. 108.
3. "History, Louisiana Ordnance Plant, Shreveport, Louisiana, January 9, 1943," pp. 11, 15-17, 21-24, unpublished report prepared by Silas Mason Company, 1943, in Thiokol Corporation files, LAAP.
4. "History, January 9, 1943," p. 9.

5. "History, January 9, 1943," p. 1.
6. "History, January 9, 1943," p. 25.
7. "History, January 9, 1943," p. 2.
8. Thomson and Mayo, p. 110.
9. Thomson and Mayo, pp. 1, 28. Key personnel of the Silas Mason Company also received intensive munitions manufacture training during the LAAP's construction at Picatinny Arsenal, Kinsbury Ordnance Depot, Ravenna Ordnance Works, Elwood Ordnance Plant, and elsewhere ("History, January 9, 1943," pp. 28-29).
10. "History, January 9, 1943," pp. 8-11.
11. "DARCOM Installation and Activity Brochure," p. 1, unpublished, June 30, 1980. Ammunition Lines E and F were supplied by an ammonium nitrate crystal plant (Area N) until May 19, 1943, when on-site ammonium nitrate production ceased. By 1943, TNT substitutes, such as amatol (a mixture of TNT and ammonium nitrate), were no longer needed; the acute TNT shortage of 1941-1942 had vanished with the coming into full production of new, highly efficient TNT plants ("History, Louisiana Ordnance Plant, Shreveport, Louisiana, Second Quarter - 1943," p. 47, unpublished report prepared by Silas Mason Company, 1943, in Thiokol Corporation files, LAAP; Thomson and Mayo, pp. 134-135). On November 1, 1943 production resumed at Area N, "the entire output earmarked for [the] Tennessee Valley Authority for use in the manufacture of fertilizer (William Voight, Jr., "GOCO Plant Directory," in "The Ordnance Organization in World War II," p. 203, unpublished report, on microfiche, 1945, in AMCCOM Historical Office Archives, Rock Island Arsenal). Area N is no longer extant.
12. "Welcome to the Louisiana Army Ammunition Plant" (LAAP: Thiokol Corporation, n.d.), p. 1, in Thiokol Corporation files, LAAP.
13. A 1945 site plan and a complete "Index of Buildings and Plans," organized by designated areas, is found in "Industrial Facilities Inventory Report, Louisiana Ordnance Plant, Minden, Louisiana," pp. 1-15, unpublished report prepared by U.S. Engineer Office, Little Rock, Arkansas, September, 1945, in Thiokol Corporation files, LAAP.
14. According to the Ordnance Department's Safety Officer, "the guiding principals which were followed in laying out [a] plant are: 1. Hazardous operations have been separated from each other by barricades or by placing them in separate buildings. 2. Operating buildings have been separated from each other by safe distances to prevent the spread of fires or explosions. 3. Operating buildings have been grouped into separate production lines whose sizes and capacities are based on efficient and economical operation. Examples are fuze-loading lines, complete rounds loading lines, and anhydrous ammonia manufacturing lines. The lines are separated from each other by distances which not only will give protection against the spread of fires and explosions,

but also will prevent explosions in one line from structurally damaging buildings in other lines. 4. Equipment layouts in operating buildings have been made with a view toward eliminating hazards from electrical installations, mechanical or static sparks, and fires from lightning or other causes. 5. Change houses and bomb proof shelters have been provided where necessary for the comfort and safety of operating personnel" (Major George D. Rogers, "Military Explosives," National Safety News, 44 (July, 1941), p. 22.

15. A discussion of the design and spacing of magazines is presented in LTC. C.H. Cotter, "Naval Ammunition Depot Near Hawthorne, Nev., Built to Serve the Pacific Coast," Engineering News-Record, 105 (November 20, 1930), pp. 803-805. Igloos at the LAAP were the single-barrel-vault, "Standard Underground Storage Magazine." They were constructed of reinforced concrete with an earth cover and varied in dimension from 12' x 12' to a nominal 28 feet in width by 40, 60 and 80 feet in length. A discussion of similar igloo construction is presented in Paul Nissen, "Igloos of Concrete," Pacific Builder and Engineer, 47 (September, 1941), pp. 40-44.
16. Overhead trolley conveyors are used extensively at the LAAP. A detailed description of these conveyors is contained in "Truck-Tow Conveyors," Steel, 116 (March 12, 1945), pp. 124-126.
17. "History, January 9, 1943," p. 25.
18. "History, January 9, 1943," p. 25. The lightweight outer wall construction also was intended to reduce the force of explosions. Baffle walls were incorporated to divide loading buildings into many protected "cells" ("Largest Shell-Loading Plant Goes Into Operation," Chemical & Metallurgical Engineering, 48 (August, 1941), p. 89.
19. "History, January 9, 1943," p. 26.
20. "DARCOM Installation and Activity Brochure," p. 1.
21. R. J. Hammond, "Profile on Munitions, 1950-1977," p. 40, unpublished report on microfiche, n.d., in AMCCOM Historical Office Archives, Rock Island Arsenal.
22. "DARCOM" Installation and Activity Brochure," p.1.
23. Voight, pp. 4-5.
24. "Hourly Earnings in the Ammunition-Loading Industry, 1944," Monthly Labor Review, 60 (April, 1945), pp. 840-841.
25. "History, Louisiana Ordnance Plant, Shreveport, Louisiana, Fourth Quarter-1943," p. 15, unpublished report prepared by Silas Mason Company, 1943, in Thiokol Corporation files, LAAP. Additional information regarding production modifications is contained in similar historical reports for the third quarter, 1943, and the first and third quarters, 1944, which are also located in Thiokol Corporation files, LAAP.

29. "DARCOM Installation Inventory of Military Real Property," computer print-out, December 31, 1981.
30. Hammond, p. 40.
31. "DARCOM Installation and Activity Brochure," pp. 1-2.
32. "Aerial and Artillery Firepower, Shreveport Magazine, 10 (June, 1955), pp. 22, 38.
33. Voight, p. 19.
34. This evaluation of the 155-mm technology is based on a tour of the facility conducted by Carl McDaniel of Thiokol Corporation on January 21, 1983, and detailed production information on the Willys-Overland Motors Company's shell-casing plant provided by Joseph Frazer, "Millions of 155-Millimeter Shells," Ordnance Production Methods, ed. Charges O. Herb (New York: Industrial Press, 1951), pp. 83-97.
35. Frazer, p. 83.
36. An illustrated overview of Y-Line production areas is provided in Robert F. Huber, "Shell Making with the New Look," Steel, 137 (December 19, 1956), pp. 88-91.
37. Frazer, pp. 83-97.
38. "DARCOM Installation and Activity Brochure," p. 1.
39. Currently, Areas C, D, H, K (intermittently), S and Y are in active production; Area F is inactive; and Areas E, G and J are "laid-away."
40. "DARCOM Installation and Activity Brochure," p. 2.
41. "Annual History Review, Louisiana Army Ammunition Plant, October 1, 1980 to September 30, 1981," p. vi, unpublished report prepared by Thiokol Corporation, 1981, in Thiokol Corporation files, LAAP.
42. Descriptions of this incident are in "Minden Blast Death Toll Climbs to Four," Shreveport Journal, August 17, 1968, p. 1; "More Blasts Delay Probe; 2 Killed, 4 Missing, 9 Hurt," The Shreveport Times, August 18, 1968 p. 1; "Man Still Missing in Plant Blast," The Shreveport Times, August 19, 1968, p. 4-A.
43. "Annual History Review, Louisiana Army Ammunition Plant, October 1, 1980 to September 30, 1981," p. vi.
44. Three of the original four 155-mm 107HE production lines were removed from the shell plant building during modernization. The fourth line is currently inactive.

Chapter 3

PRESERVATION RECOMMENDATIONS

BACKGROUND

Army Regulation 420-40 requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling.¹ The purpose of such a program is to:

- . Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's heritage.
- . Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- . Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- . Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- . Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the general preservation recommendations set forth below have been developed:

Category I Historic Properties

All Category I historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for

nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category I historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I historic properties should not be altered or demolished. All work on such properties shall be performed in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).
- b) An individual preservation plan should be developed and put into effect for each Category I historic property. This plan should delineate the appropriate restoration or preservation program to be carried out for the property. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulation. Until the historic preservation plan is put into effect, Category I historic properties should be maintained in accordance with the recommended approaches of the Secretary of Interior's Standards for Rehabilitation and

Revised Guidelines for Rehabilitating Historic Buildings² and in consultation with the State Historic Preservation Officer.

- c) Each Category I historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.³ When no adequate architectural drawings exist for a Category I historic property, it should be documented in accordance with Documentation Level I of these standards. In cases where standard measured drawings are unable to record significant features of a property or technological process, interpretive drawings also should be prepared.

Category II Historic Properties

All Category II historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category II historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category II historic properties should not be altered or demolished. All work on such properties shall be performed

in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

- b) An individual preservation plan should be developed and put into effect for each Category II historic property. This plan should delineate the appropriate preservation or rehabilitation program to be carried out for the property or for those parts of the property which contribute to its historical, architectural, or technological importance. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulations. Until the historic preservation plan is put into effect, Category II historic properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings⁴ and in consultation with the State Historic Preservation Officer.
- c) Each Category II historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level

II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁵

Category III Historic Properties

The following preservation recommendations apply to Category III historic properties:

- a) Category III historic properties listed on or eligible for nomination to the National Register as part of a district or thematic group should be treated in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800). Such properties should not be demolished and their facades, or those parts of the property that contribute to the historical landscape, should be protected from major modifications. Preservation plans should be developed for groupings of Category III historic properties within a district or thematic group. The scope of these plans should be limited to those parts of each property that contribute to the district or group's importance. Until such plans are put into effect, these properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised

Guidelines for Rehabilitating Historic Buildings⁶ and in consultation with the State Historic Preservation Officer.

- b) Category III historic properties not listed on or eligible for nomination to the National Register as part of a district or thematic group should receive routine maintenance. Such properties should not be demolished, and their facades, or those parts of the property that contribute to the historical landscape, should be protected from modification. If the properties are unoccupied, they should, as a minimum, be maintained in stable condition and prevented from deteriorating.

HABS/HAER Documentation Level IV has been completed for all Category III historic properties, and no additional documentation is required as long as they are not endangered. Category III historic properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.⁷ Similar structures need only be documented once.

CATEGORY I HISTORIC PROPERTIES

There are no Category I historic properties at the LAAP.

CATEGORY II HISTORIC PROPERTIES

There are no Category II historic properties at the LAAP.

CATEGORY III HISTORIC PROPERTIES

There are no Category III historic properties at the LAAP.

NOTES

1. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).
2. National Park Service, Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: Preservation Assistance Division, National Park Service, 1983).
3. National Park Service, "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines," Federal Register, Part IV, 28 September 1983, pp. 44730-44734.
4. National Park Service, Secretary of the Interior's Standards.
5. National Park Service, "Archeology and Historic Preservation."
6. National Park Service, Secretary of the Interior's Standards.
7. National Park Service, "Archeology and Historic Preservation."

BIBLIOGRAPHY

Published Sources

A Guide to the Sources of United States Military History. Hamden, Conn.: Archon Books, 1975.

"Aerial and Artillery Firepower." Shreveport Magazine, 10 (June, 1955), 22, 38.

Applied Science and Technology Index. 1958-1980.

"Blast Toll Hits Five At LAAP." The Shreveport Times. August 19, 1968.

Cotter, LTC. C.H. "Naval Ammunition Depot Near Hawthorne, Nev., Built to Serve the Pacific Coast." Engineering News-Record, 105 (November 20, 1930), 803-805. Contains a discussion of the design and spacing of magazines.

Engineering Index. 1938-1980.

Frazer, Joseph, "Millions of 155-Millimeter Shells," Ordnance Production Methods, ed. Charles O. Herb, New York, Industrial Press, 1951. Describes production techniques at the Willys-Overland Motors Plant in Toledo, Ohio, during World War II.

"Hourly Earnings in the Ammunition-Loading Industry, 1944." Monthly Labor Review, 60 (April, 1945), 840-841. Contains an excellent overview of load, assemble and pack processes.

Hoy, Suellen M., and Robinson, Michael C., eds. Public Works History in the United States. Nashville: American Association for State and Local History, 1982.

Huber, Robert F. "Shell Making with the New Look." Steel, 137 (December 19, 1956), 88-91. An excellent, illustrated overview of 155-mm projectile manufacture at LAAP.

Industrial Arts Index. 1938-1957.

Jessup, John E., and Coakley, Robert W. A Guide to the Study and Use of Military History. Washington, D.C.: United States Printing Office, 1979.

"Largest Shell-Loading Plant Goes Into Operation." Chemical & Metallurgical Engineering, 48 (August, 1941) 89. Presents design rationale for loading building construction.

"Man Still Missing in Plant Blast." The Shreveport Times. August 19, 1968.

"Minden Blast Death Toll Climbs to Four." Shreveport Journal. August 17, 1968.

"More Blasts Delay Probe; 2 Killed, 4 Missing, 9 Hurt. The Shreveport Times . August 17, 1968.

National Park Service. "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines." Federal Register, Part IV (28 September 1983), 44730-44734.

_____. How to Complete National Register Forms. Washington, D.C.: U.S. Government Printing Office, 1977.

_____. Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983. Washington D.C.: Preservation Assistance Division, National Park Service, 1983.

Nissen, Paul. "Igloos of Concrete." Pacific Builder and Engineer, 47 (September, 1941), 40-44. Discusses "Standard Underground Storage Magazine" construction.

Quayle, L.A. "Volumetric Pouring Machine." Mechanical Engineering, 67 (September, 1945), 599-606. Contains an excellent comprehensive discussion of the development and operation of mechanized shell loading processes.

Rogers, Major George D. "Military Explosives." National Safety News, 44 (July, 1941), 22-23, 77-80. Contains information regarding safety considerations for ammunition plant layout.

Thomson, Harry C. and Mayo, Lida, The Ordnance Department: Procurement and Supply, Washington, D.C.: Office of the Chief of Military History, Department of the Army, 1960. Contains excellent chapter on the operation and construction of government-owned, contractor-operated plants during World War II.

"Truck-Tow Conveyors." Steel, 116 (March 12, 1945), 124-126. Discusses the design and operation of overhead trolley conveyors.

"Welcome to LAAP." Prepared by Thiokol Corporation, n.d. Thiokol Corporation files, LAAP. An information brochure distributed at LAAP.

Unpublished Sources

"Annual History Review, Louisiana Army Ammunition Plant, October 1, 1980 to September 30, 1981." Prepared by Thiokol Corporation, 1981. Thiokol Corporation files, LAAP.

"DARCOM Installation and Activity Brochure." June 30, 1980. Thiokol Corporation files, LAAP. Provides historical and production overview for World War II, Korean War, and Vietnam War.

"DARCOM Installation Inventory of Military Real Property." Computer print-out, December 31, 1981. Thiokol Corporation files, LAAP.

- "Hammond, R.J. "Profile on Munitions, 1950-1977." Report prepared for the Ordnance Department, n.d. On microfiche, AMCCOM Historical Office, Rock Island Arsenal.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, January 9, 1943," Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP. Contains an excellent, detailed discussion of World-War-II-era LAAP construction and technology.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, Second Quarter-1943." Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, Third Quarter-1943." Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, Fourth Quarter-1943." Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, First Quarter-1944." Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana, Third Quarter-1943." Prepared by Silas Mason Company, 1943. Thiokol Corporation files, LAAP.
- "History, Louisiana Ordnance Plant, Shreveport, Louisiana - September, 1945 through June 30, 1951." Prepared by Remington Rand, Inc., 1951. Thiokol Corporation files, LAAP. Discusses LAAP production line rehabilitation work during the Korean War reactivation.
- "Industrial Facilities Inventory Report, Louisiana Ordnance Plant, Minden, Louisiana." Report prepared by U.S. Engineer Office, Little Rock, Arkansas, September, 1945. Thiokol Corporation files, LAAP. Contains a 1945 site plan and a complete list of all buildings constructed at LAAP during World War II.
- Voight, William, Jr. "The Ordnance Organization in World War II." Report prepared for the Ordnance Department, 1945. On microfiche, AMCCOM Historical Office, Rock Island Arsenal. Provides brief historical sketches of all government-owned, contractor-operated munitions plants during World War II.

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